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INVITED LECTURE - Transmutation of minor actinides in the molten salt reactor recently studied in Russia

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Abstract

The extremely high solubility of PuF3, AmF3 and the fission product fluorides in the eutectics LiF-NaF-KF observed recently (Fig.1 and 2) [1,2] allows to create the efficient molten salt reactor –transmuter (MSRT) for transmutation of the minor actinides (MA) from the spent nuclear fuel [3]. This observation opens also the way to the development of the molten salt fast reactor (MSFR) [2] with U-Pu cycle and changes the general approach to its closed nuclear fuel cycle (CNFC) realization. The first results are presented, obtained by the wide collaboration of Russian Institutes in the framework of the Rosatom program "Strategy of the minor actinides transmutation in the closed nuclear fuel cycle"[1], particularly the main parameters of the efficient subcritical MSRT which can transmute ˜300 kg Am/GW•year without Pu consummation in the equilibrium mode operation [3].

1. Annual report #H.4F.45.90.11.1020 "Optimization of the minor actinide reactor-transmuter characteristics and its nuclear fuel cycle development", Rosatom, 2011.
2. A.M. Degtyarev and L.I. Ponomarev, "Fast molten salt reactor based on LiF-NaF-KF", Atomnaya Energia, 112, p.367-368, 2012.
3. A.M. Degtyarev, O.S. Feinberg, F.I. Karmanov, et. al., "Subcritical Molten Salt Reactor with fast/intermediate Spectrum for Minor Actinides Transmutation", Proc. GLOBAL-2011, Murahari, Japan, paper 386820, 2011.

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